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# CANADIAN PATENT

WATER-PERMEABLE FELT

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No. OF CLAIMS 10

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This invention relates to an improved water-permeable felt for use in the manufacture of paper, pulp and like products and more particularly to a water-permeable felt with improved drainage properties.

Although this invention is described as embodied in a paper machine execution, it will be understood that the invention may be utilized for any machine which uses a woven felt to support a web of fibres, while allowing water to drain through the felt, as, for example, in the manufacture of certain building products such as, asbestos pipes and sheets, asphalt shingles and like products.

One well known method of manufacturing paper makers felts, is to produce a base fabric from yarn by conventional weaving and to mechanically lock a layer of fibres onto the base fabric. The mechanical locking is produced by plunging a plurality of needles through the fibre layer and into the base fabric, which causes fibres from the layer to project into the base fabric and to be interlocked therewith. This process is known as "needling" and the felts produced by this process are known as "needled felts".

One of the disadvantages of paper makers felts in general is that, due to plugging, increased density while under nip pressure and other factors, the rate at which water can be removed from the wet web of paper and the volume of the water thus removed, is greatly decreased.

Another disadvantage is that, when used on paper machines equipped with suction press rolls, under certain conditions of operation, the paper stock on the upper surface of the wet felt is disarranged, due to downward distortion of the felt into the suction holes in the shell of the suction roll, resulting in the common fault known as shadow marking or press marking.

A further disadvantage is that, again under certain conditions of operation, the weave pattern of the felt is impressed on the paper stock such that, the weave pattern is visible on the finished paper, resulting in an inferior product.

10      The present invention overcomes the above mentioned disadvantages by providing an improved base fabric comprising a two plane woven yarn construction, with each plane having different characteristics, and a layer of fibres mechanically needled to the upper plane thereof.

The lower plane, of the two plane base fabric, consists of relatively large diameter synthetic yarns, with a high degree of twist, woven in a plain weave and of open weave construction, thus leaving relatively large drainage or discharge holes. These synthetic yarns may be continuous filaments or staple fibres of Nylon, Terylene or other polyester fibres.

20      The upper plane, of the two plane base fabric, consists of relatively fine diameter yarns, woven in a close weave construction, and made from wool, or from mixtures of wool with nylon, terylene or similar polyester fibres.

    In the preferred execution of this invention, the weft yarns of the lower plane are interwoven with the warp yarns of the upper plane and the weft yarns of the upper plane are woven with the warp yarns of the upper plane in four end sateen order. In this manner, the two planes are joined together, or self stitched, by appropriate interchange of yarns in the weaving process, thus forming the base fabric for subsequent needling of a layer of fibres onto the surface of the upper plane. The layer of fibres, thus needled, is composed of wool,  
30      or mixtures of wool with nylon, terylene or similar polyester fibres, in suitable proportions.

The closely interwoven relatively small diameter warp and weft strands of the upper plane of the base fabric provide a desirably smooth and uniform support for the water absorbing layer of fibres which is needled to the base fabric. This upper plane of the base fabric also serves to eliminate, or at least minimize, the weave pattern marking of the paper stock which occurs with conventional needled felts in which the water absorbing covering layer of fibres is needled to a base fabric made by conventional weaving procedure.

10        In addition to giving a high rate of drainage the lower plane of the base fabric, which is composed of relatively large diameter hard twist yarns, affords sufficient rigidity to prevent the felt collapsing under pressure and also serves to hold the closely woven upper plane of the fabric and the covering layer of water absorbing fibres away from press or other surfaces over which the felt travels when in use. For example, the lower plane of the two plane base fabric is designed to give sufficient support for the remaining upper layers of the felt to prevent or reduce distortion of the felt  
20        downwards into the suction holes of suction press rolls, such as are frequently used in the press sections of paper-making machines.

Thus the relatively large drainage holes, formed by the open weave construction of the lower plane, provide minimum obstruction to the passage of water which has passed through the closely interwoven upper plane of the fabric. Drainage is also assisted by the entrapment of water in the drainage holes, part of the entrapped water being carried to the outgoing side of the press nip and discharging onto the lower roll face or  
30        to atmosphere, where it is suitably collected.

It is, therefore, the main object of this invention to produce a water-permeable felt with improved drainage characteristics, allowing water to be removed from a web of paper stock at a higher rate and in greater quantity than heretofore, thus reducing the amount of heat required in the subsequent drying process.

Another object of this invention is to produce a water-permeable felt which will eliminate the common fault in paper-making known as shadow marking or press marking.

10 A further object of this invention is to produce a water-permeable felt which, by preventing the weave pattern of the felt from being impressed on the web of paper stock, results in a finished paper of superior quality.

These and other objects of this invention will be apparent from the following detailed specification and figures in which:

20 Fig. 1 is a side view of a typical paper-making machine press section comprising two press rolls forming a nip, with a web of paper stock and supporting water-permeable press felt passing therethrough.

Fig. 2 is an enlarged section on 2-2 of Fig. 1 and shows a diagrammatic sectional view through a water-permeable felt, according to this invention.

Fig. 3 is a view, to a reduced scale, showing the plain weave and open construction of the warp and weft yarns of the lower plane only of the two plane base fabric, as viewed in the direction of arrow 3 in Fig. 2.

30 Fig. 4 is a diagrammatic sectional view, similar to Fig. 2, but with the needled fibre layer removed from the upper plane of the two plane base fabric.

With reference now to the figures, Fig. 1 shows a typical press felt installation in which two press rolls 11 and 12 form a nip 13, with a web of paper stock 14 supported on the upper surface 15 of press felt 16, and passing through nip 13.

Fig. 2 shows, diagrammatically, a sectional view through the preferred execution of the self stitched two plane base fabric in which, the first five weft yarns of a twelve weft yarn pattern are interwoven across the upper and lower warp yarns in the following order: upper plane fine diameter weft yarn 17, lower plane large diameter weft yarn 18, upper plane fine diameter weft yarns 19 and 20, and lower plane large diameter weft yarn 21.

The upper plane weft yarns are interwoven with the upper plane fine diameter warp yarns 22 in a four end sateen order and the lower plane weft yarns are interwoven with lower plane large diameter warp yarns 23 in plain weave and are also interwoven with the upper plane warp yarns 22, to form a self stitched two plane base fabric.

Fig. 3 shows the warp yarns 23 and the weft yarns, shown generally at 24, of the lower plane only, woven in plain weave and of open construction, thus producing the drainage holes 25.

The two plane interwoven weave pattern repeats after each twelve weft yarns.

It will be understood that other designs of stitching can be used to produce two plane base fabrics with characteristics equivalent to the disclosed preferred execution.

When the two plane base fabric is fully woven, the water-permeable felt is completed by mechanically needling a layer of fibres 26 to the upper surface 27 of the upper plane, as shown diagrammatically in Fig. 2.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A felt for use in the paper-making and other industries including an interwoven two plane base fabric, the lower plane of said two plane fabric comprising relatively large diameter warp and weft yarns interwoven in open weave construction to provide drainage openings, the upper plane of said two plane fabric comprising relatively small diameter warp and weft yarns interwoven in close weave construction, and a layer of water absorbent fibres mechanically needled to said base fabric and covering the upper surface thereof.

2. A felt as set forth in claim 1 in which said interwoven two plane base fabric includes weft yarns of the lower plane interwoven with warp yarns of the upper plane.

3. A felt as set forth in claim 1 in which the warp and weft yarns of said lower plane are composed of synthetic fibres having a high degree of twist.

4. A felt as set forth in claim 1 in which the warp and weft yarns of said upper plane are composed of a mixture of wool and synthetic fibres.

5. A felt for use in the paper-making and other industries including an interwoven two plane base fabric, the lower plane of said two plane base fabric comprising relatively large diameter warp and weft yarns composed of synthetic fibres having a high degree of twist and interwoven in open weave construction to provide drainage openings, the upper plane of said two plane base fabric comprising relatively small diameter warp and weft yarns composed of a mixture of wool and synthetic fibres and interwoven in close weave construction, the interweaving of said lower and upper planes including weft yarns of the lower plane interwoven with warp yarns of the upper plane, and a layer of water absorbent fibres mechanically needled to said base fabric and covering the upper surface

thereof.

6. A method of making a felt for use in the paper-making and other industries which comprises weaving a two plane base fabric by simultaneously weaving a lower plane in an open weave construction providing large interstices or drainage openings, said lower plane consisting of relatively large diameter warp and weft yarns, and an upper plane in a close weave construction, said upper plane consisting of relatively small diameter warp and weft yarns, said two planes being simultaneously interwoven to lock the two planes together, and then mechanically needling a layer of water absorbent fibres to said base fabric to cover the upper surface thereof.

7. The method as set forth in claim 6 in which the two planes are simultaneously interwoven and locked together by interweaving the weft yarns of the lower plane with the warp yarns of the upper plane.

8. The method as set forth in claim 6 in which the warp and weft yarns of said lower plane comprise synthetic fibres having a high degree of twist.

9. The method as set forth in claim 6 in which the warp and weft yarns of said upper plane comprise a mixture of wool and synthetic fibres.

10. A method of making a felt for use in the paper-making and other industries which comprises weaving a two plane base fabric by simultaneously interweaving a lower plane in an open weave construction providing large interstices or drainage openings, said lower plane consisting of relatively large diameter warp and weft yarns composed of synthetic fibres having a high degree of twist, and an upper plane in a close woven construction, said upper plane consisting of relatively small diameter warp and weft yarns composed of a mixture of wool and synthetic fibres, said two planes being simultaneously interwoven and locked together by in-



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terweaving the weft yarns of the lower plane with the warp yarns of the upper plane, and then mechanically needling a layer of water absorbent fibres to said base fabric to cover the upper surface thereof.

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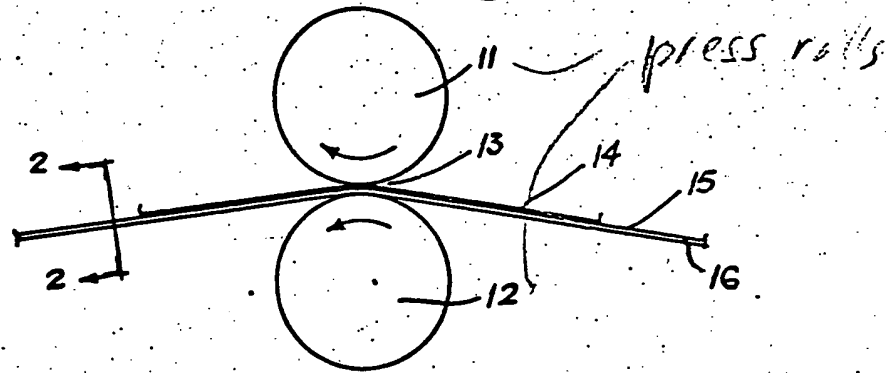


FIG. 1

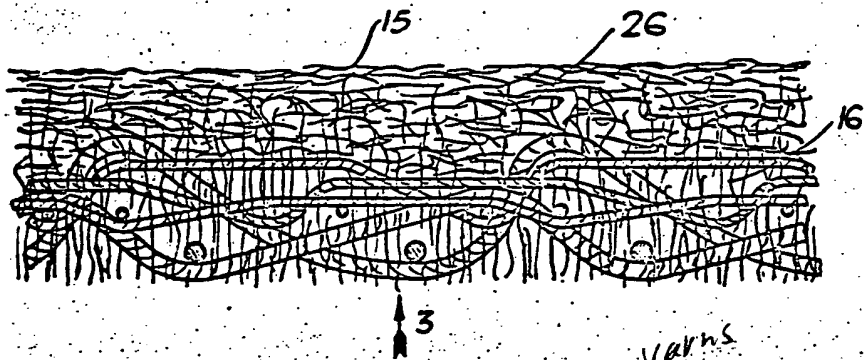


FIG. 2

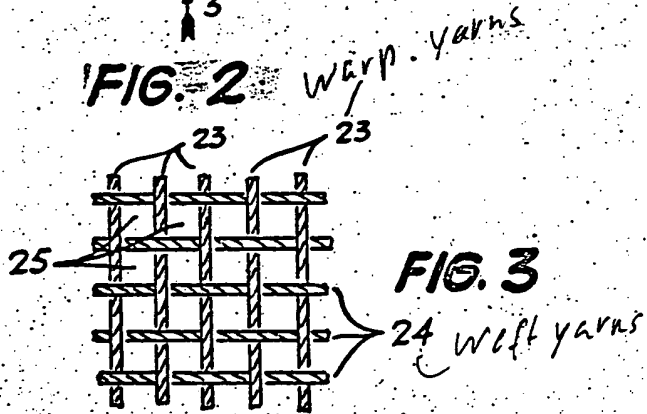


FIG. 3

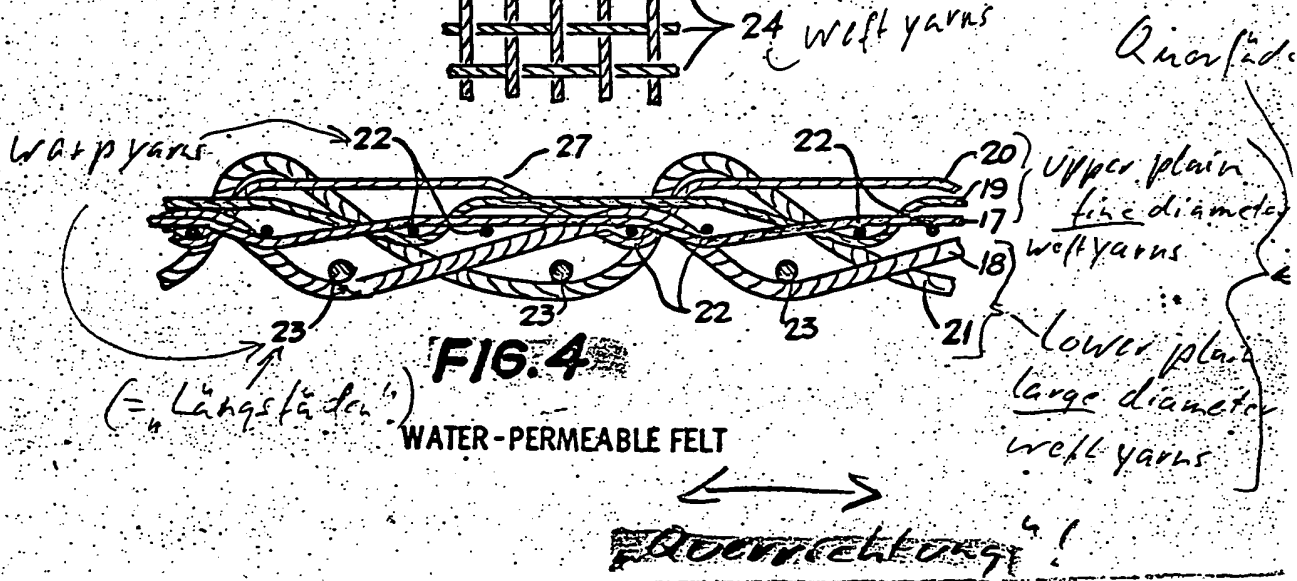


FIG. 4

WATER-PERMEABLE FELT

Querschnitt